

# REPLACEMENT SHEET

22  
Oscillating means

26  
Electric field means

10  
Electron gun

28  
Magnetic field means

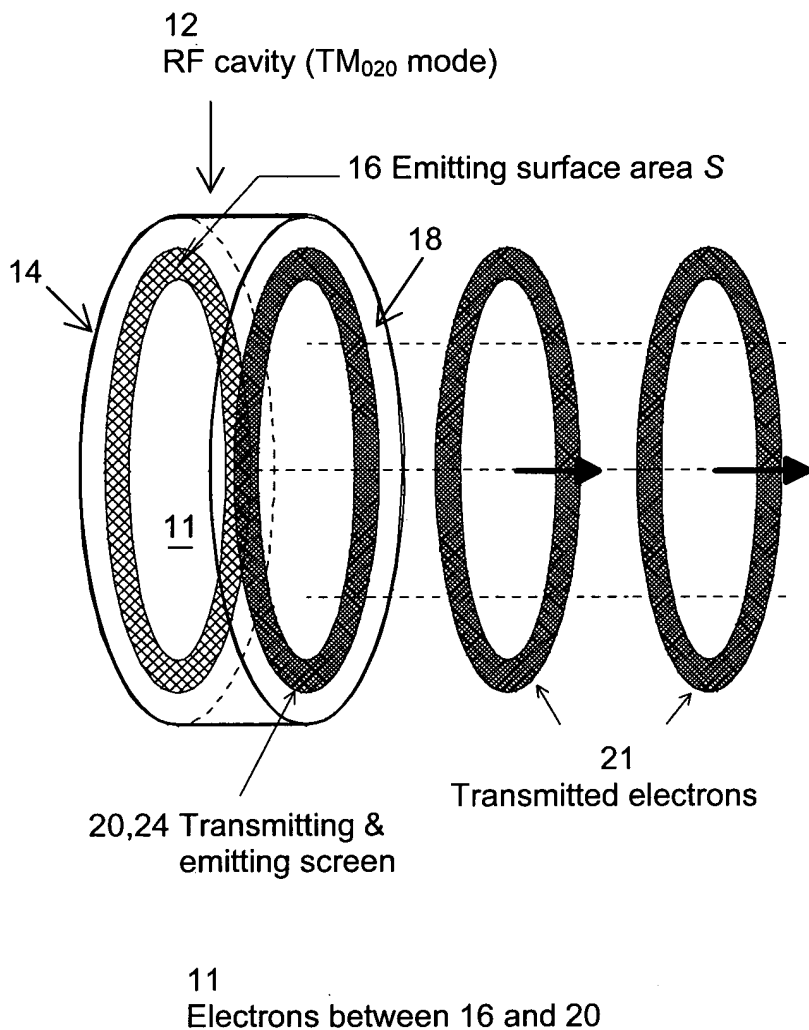


Figure 1: Perspective view of the micropulse gun for a hollow beam in the  $TM_{020}$  mode. The inner conductor is not shown.

BEST AVAILABLE COPY

# REPLACEMENT SHEET

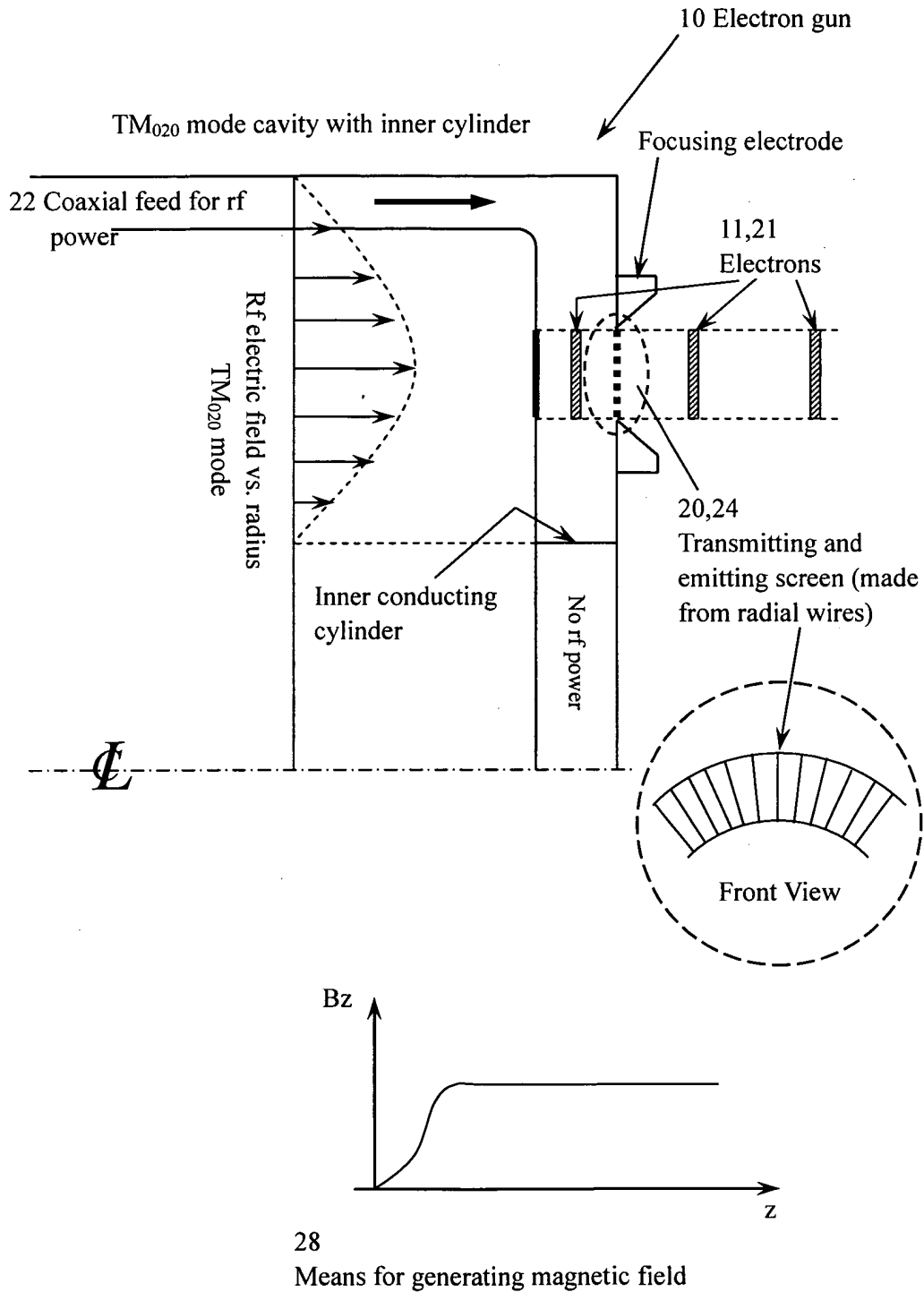


Figure 2: Schematic of rf gun operating in  $TM_{020}$  mode.

# REPLACEMENT SHEET

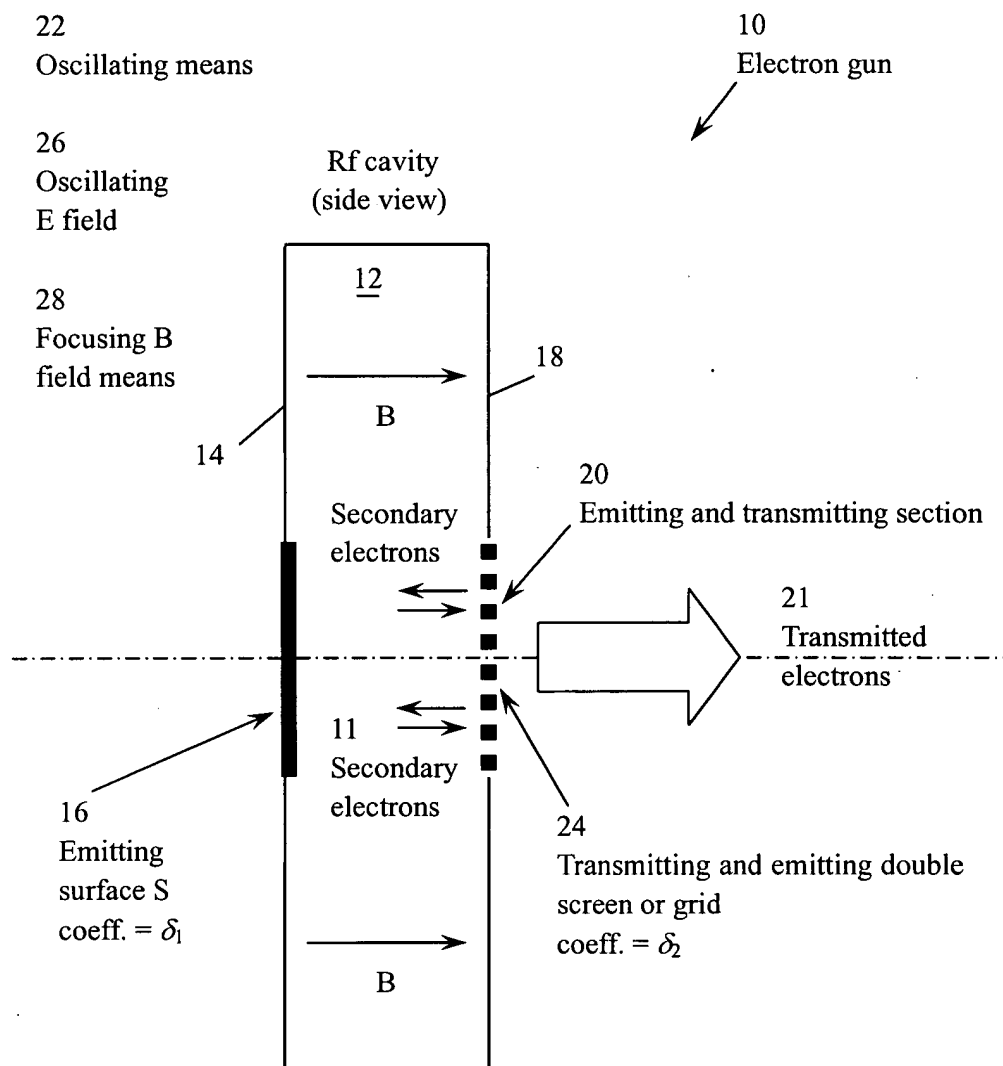
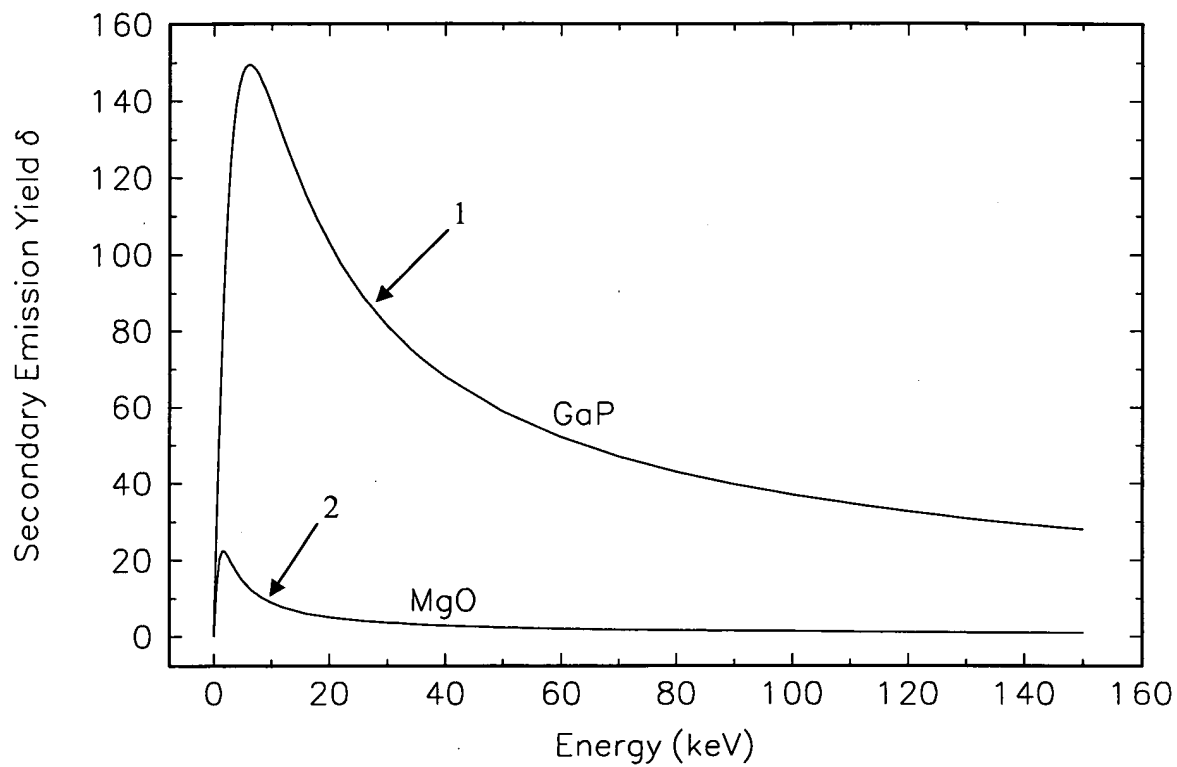


Figure 3: Schematic of micropulse gun for solid beam ( $TM_{010}$ ) mode. A coaxial feed is used for rf input (not shown).

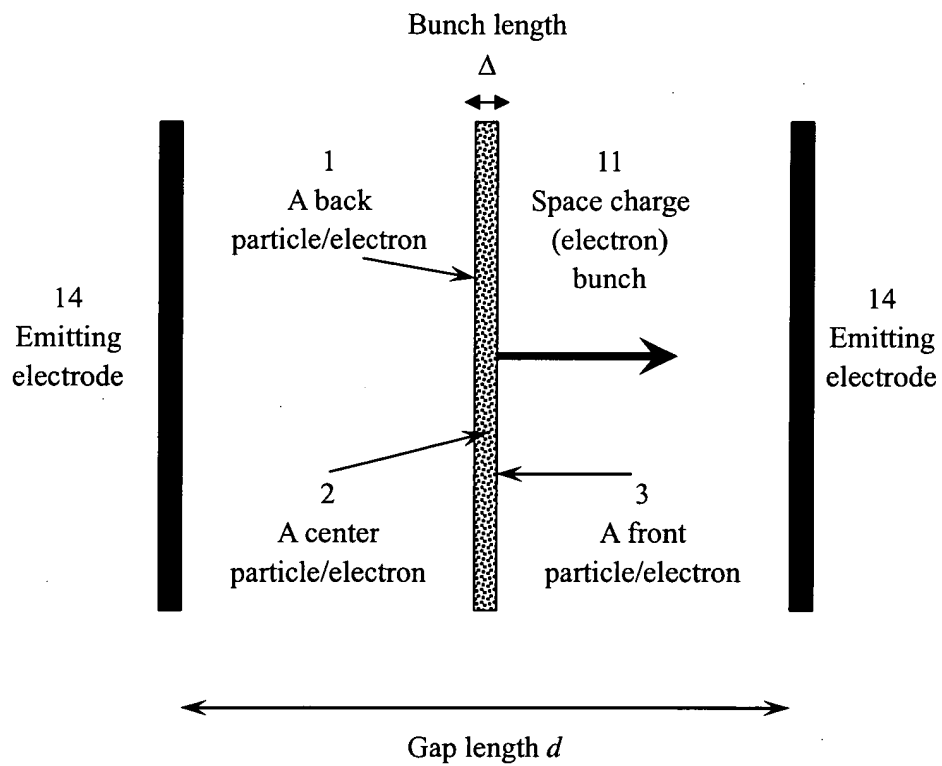
# REPLACEMENT SHEET



- 1 – Secondary emission yield of GaP
- 2 – Secondary emission yield of MgO

Figure 4: Secondary electron emission yield curve for GaP and MgO.

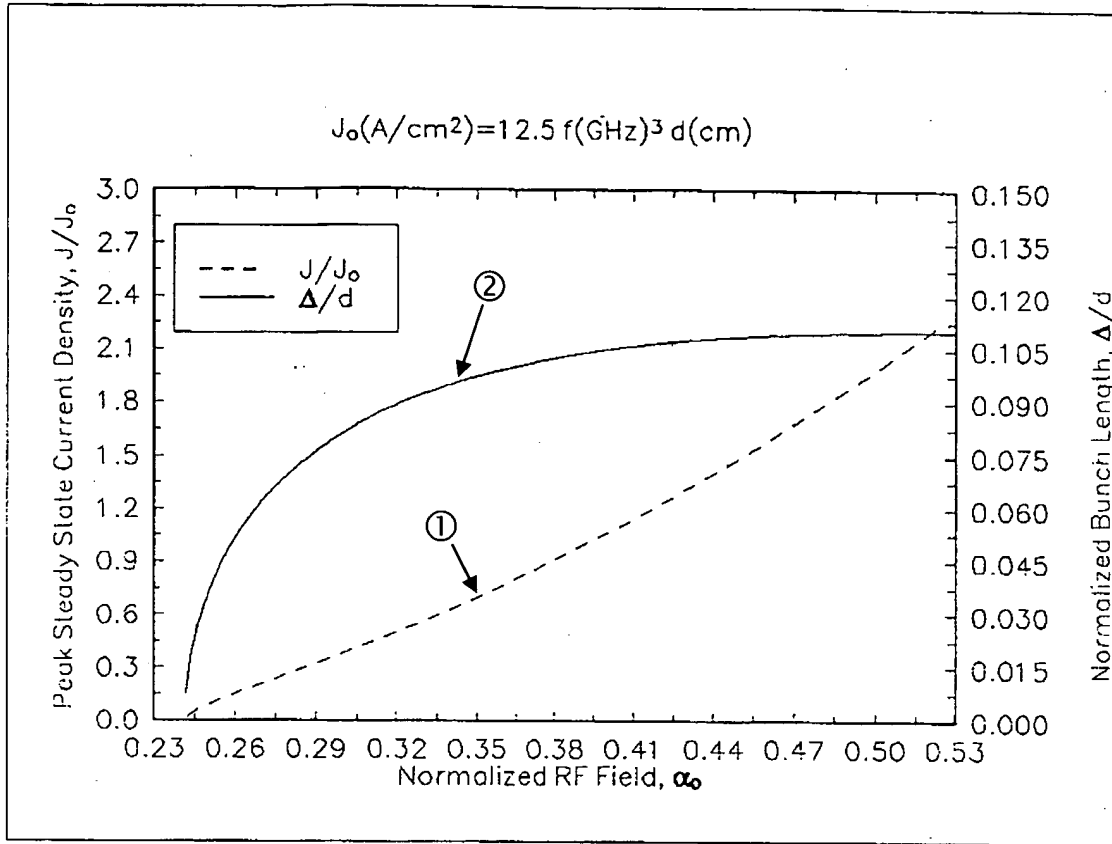
# REPLACEMENT SHEET



- 14 - Emitting electrodes
- 11 - Electron bunch
- 1 - A back particle/electron
- 2 - A center particle/electron
- 3 - A front particle/electron

Figure 5. Schematic drawing of model used in theoretical analysis.

# REPLACEMENT SHEET

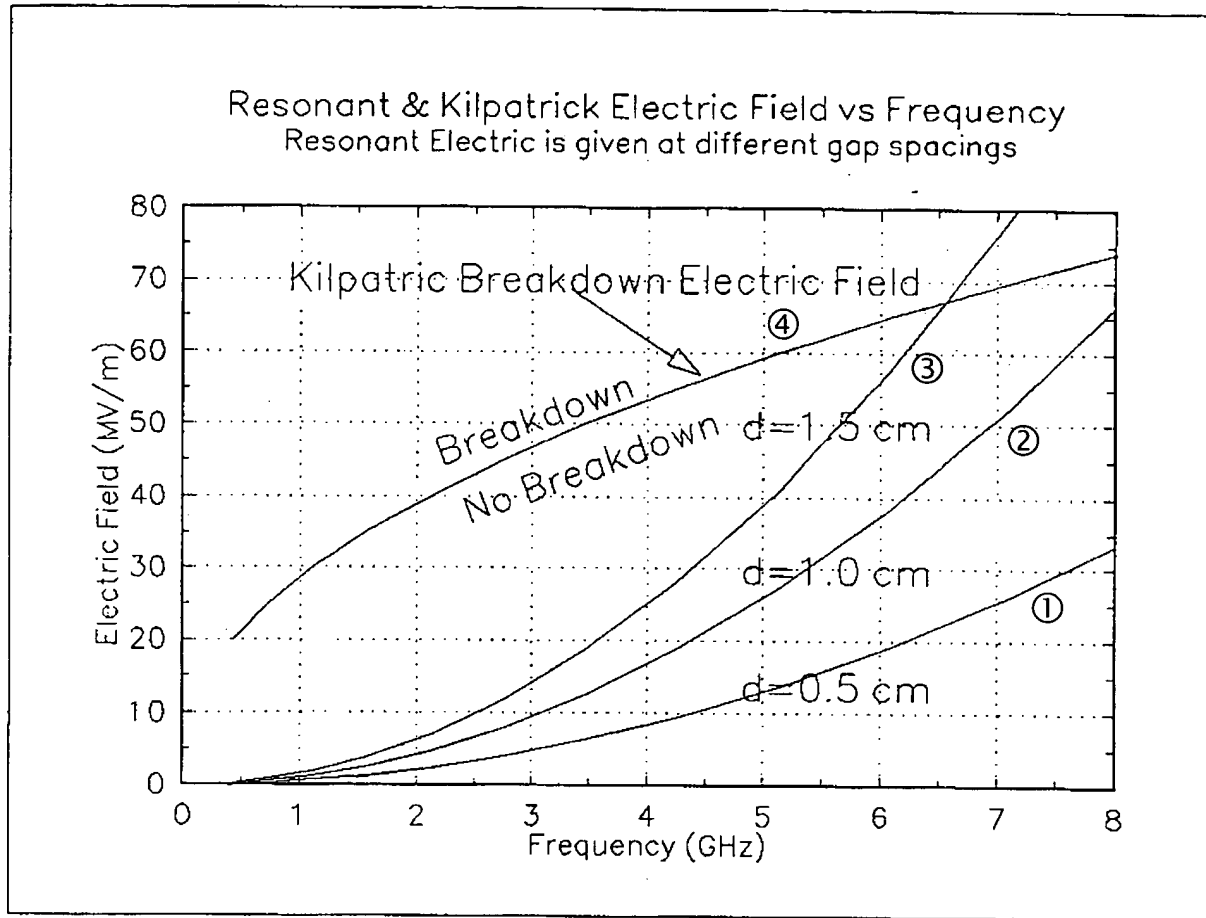


① Plot of normalized peak current density at steady state versus rf field.

② Plot of normalized electron bunch length versus rf field.

Figure 6: Steady-state current density and bunch length vs. rf field, all parameters are normalized.

# REPLACEMENT SHEET

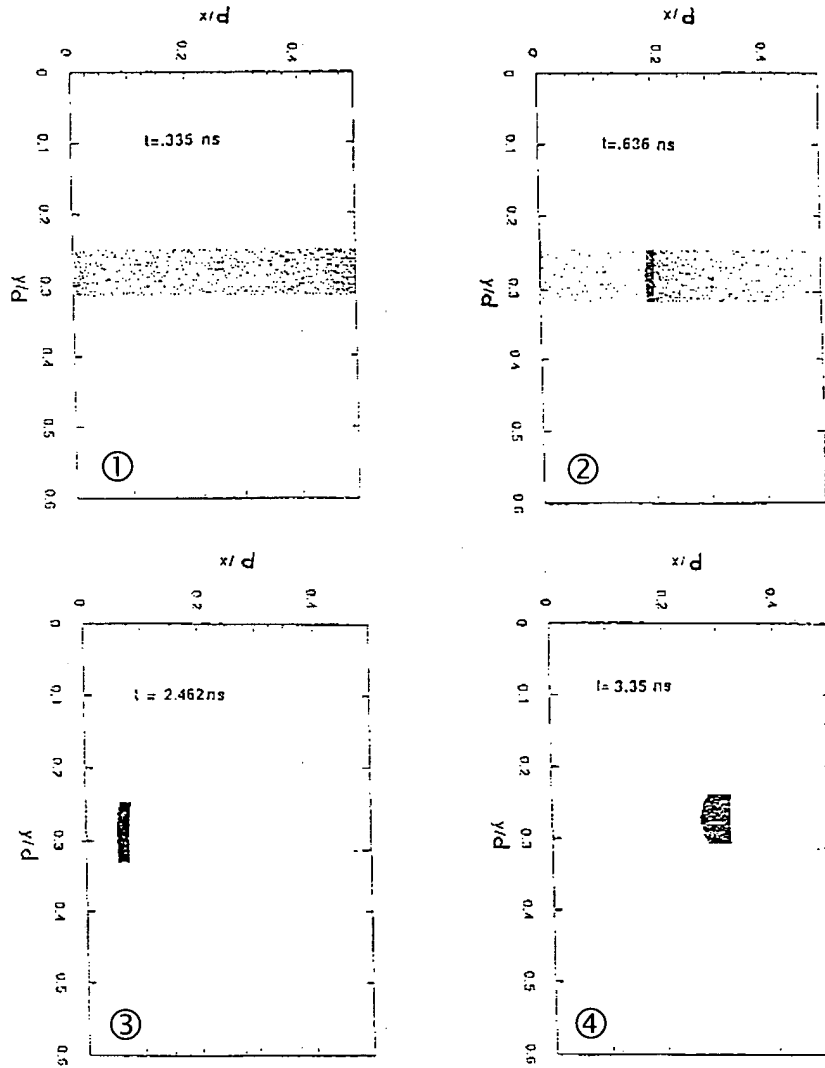


- ① Plot of resonant electric field versus frequency for 0.5 cm gap
- ② Plot of resonant electric field versus frequency for 1.0 cm gap
- ③ Plot of resonant electric field versus frequency for 1.5 cm gap
- ④ Plot of Kilpatrick breakdown electric field versus frequency.

Figure 7: Plot of resonant electric fields for  $\alpha_0 = 0.453$  and various gap spacings. Also shown is the critical Kilpatrick electric field as a function of rf frequency.

# REPLACEMENT SHEET

## 1.3 GHz, xy plot



- ① Plot of electron distribution in the cavity at  $t = 0.335 \text{ ns}$ .
- ② Plot of electron distribution in the cavity at  $t = 0.636 \text{ ns}$ .
- ③ Plot of electron distribution in the cavity at  $t = 2.462 \text{ ns}$ .
- ④ Plot of electron distribution in the cavity at  $t = 3.35 \text{ ns}$ .

Figure 8: Series of time “snapshots” for a 1.3 GHz,  $d = 0.5 \text{ cm}$  cavity using the two-dimensional PIC code with secondary emission. Note the rapid particle build-up and bunching by phase selection. Electrons traverse the horizontal axis. On the vertical axis, emission is limited to the region 0.25 to 0.32 cm.

# REPLACEMENT SHEET

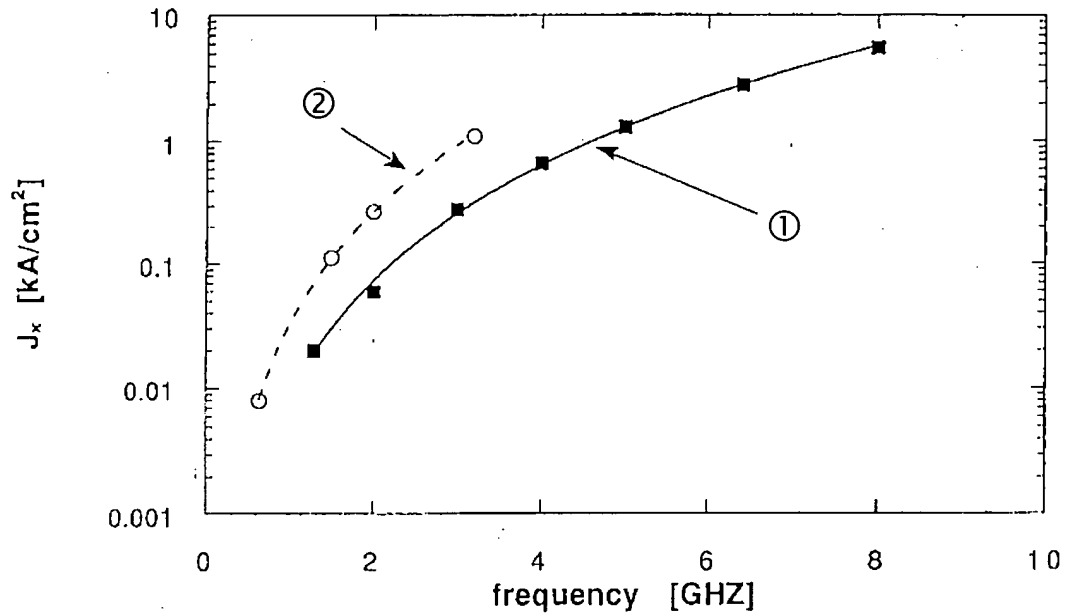
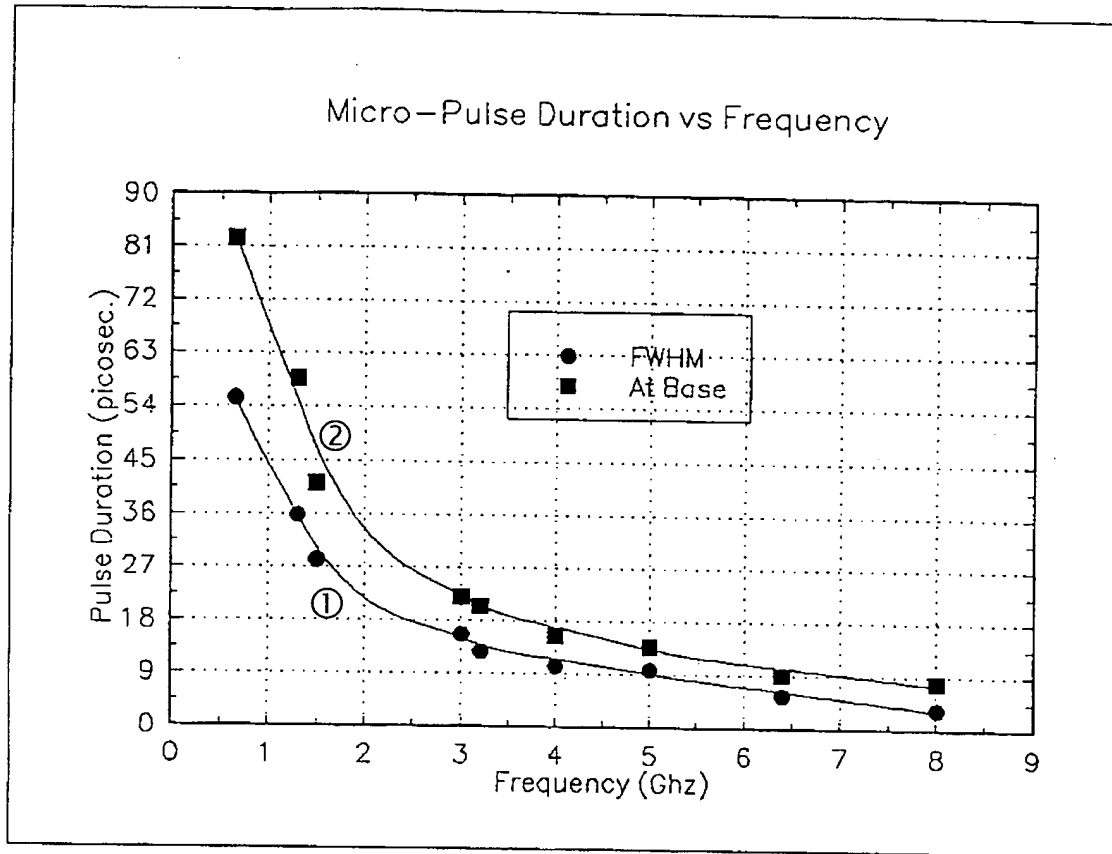


Figure 12: Steady-state current density vs. rf frequency for cavity with  $\alpha_0 = 0.453$  and gap lengths of ① 0.5 cm (solid line is a fit using  $J_x = 0.008f^{3.15}$ ) and ② 1.0 cm (dashed line is a fit using  $J_x = 0.03f^{3.1}$ ).

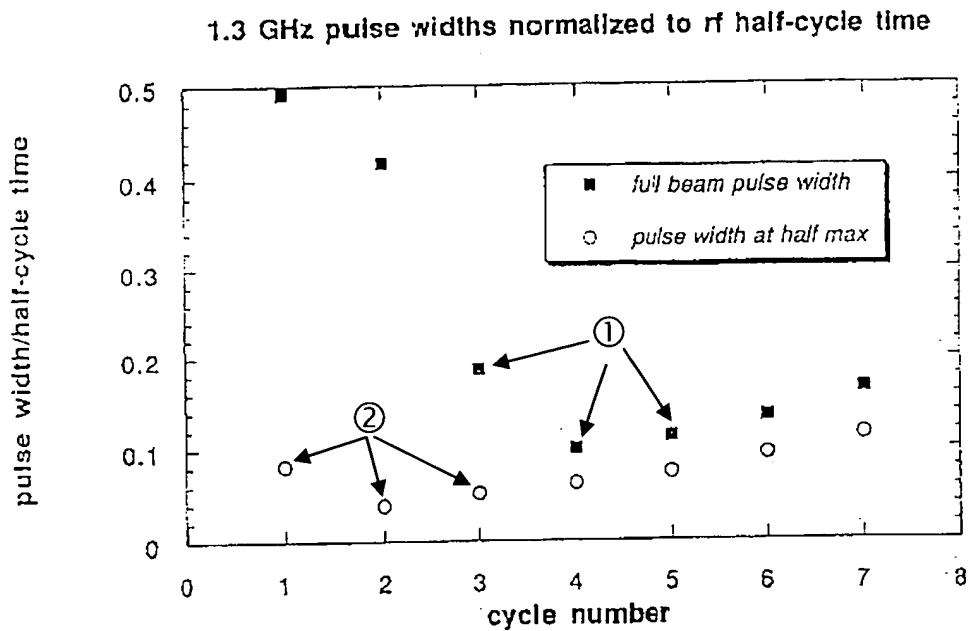
# REPLACEMENT SHEET



- ① Electron micro-pulse full width at half maximum.
- ② Electron micro-pulse full width at the base of the pulse.

Figure 13: Micro-pulse duration vs. frequency for  $\alpha_0 = 0.453$ .

# REPLACEMENT SHEET



- ① (solid square) Beam full width at different rf cycle.  
② (open circle) Beam full width at half maximum at different rf cycle.

Figure 14: Micro-pulse width (as a fraction of the half-cycle) vs. rf cycle number near the output grid. The full beam pulse width decreases with time, and reaches a minimum at the fourth rf cycle. After saturation there is a slight increase in pulse-width due to space-charge effects.

# REPLACEMENT SHEET

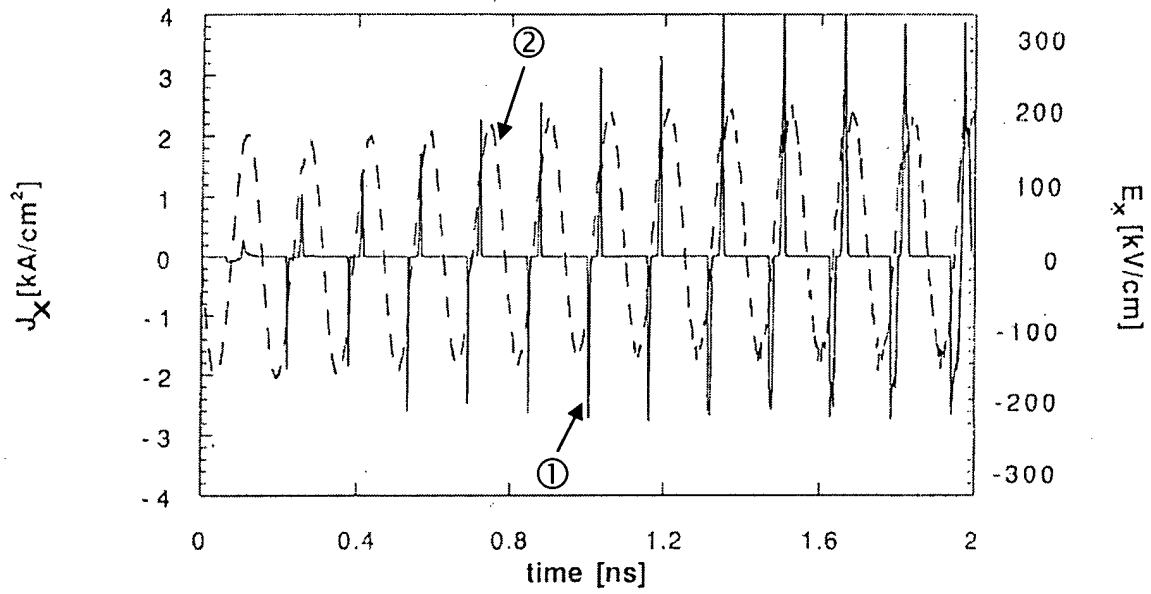


Figure 16: ① Plot of the current density in kA/cm<sup>2</sup> (solid line) and ② the longitudinal electric field (dashed line) for the 6.4 GHz, 105 kV simulation.

# REPLACEMENT SHEET

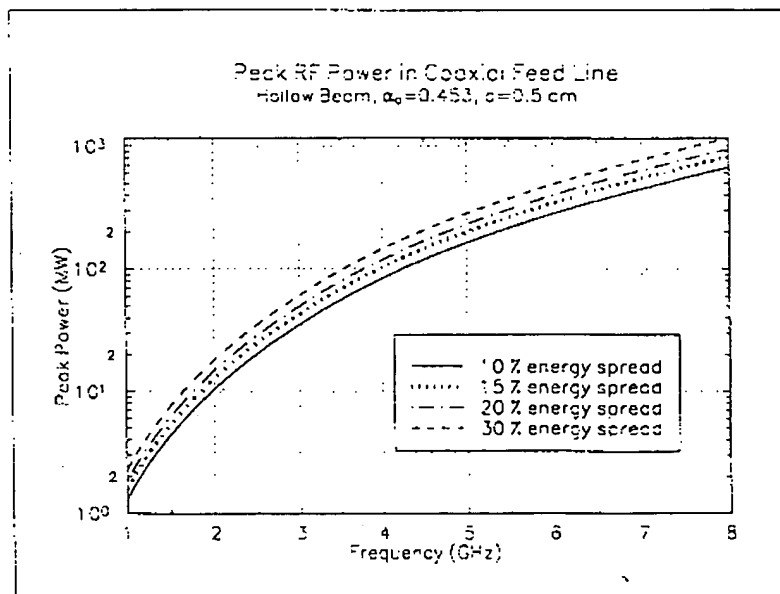
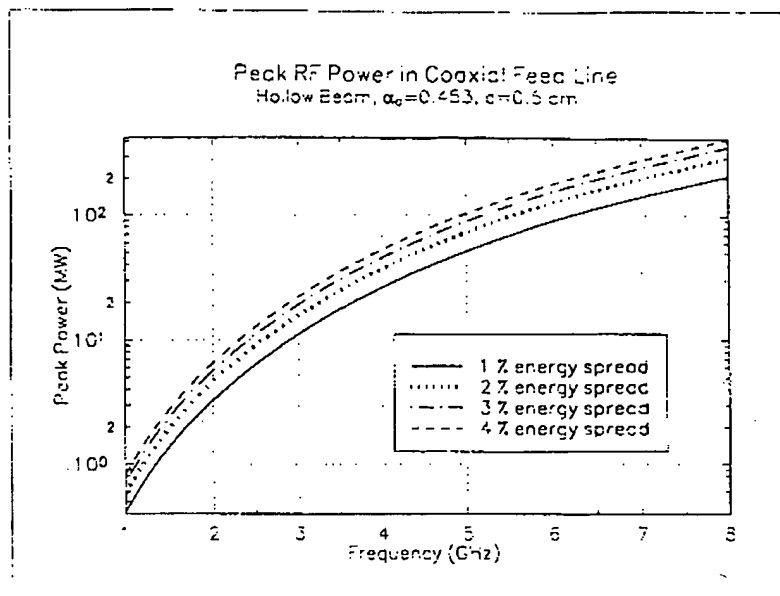


Figure 43: Peak rf power in coaxial feed line for a hollow beam,  $d = 0.5$  cm.

# REPLACEMENT SHEET

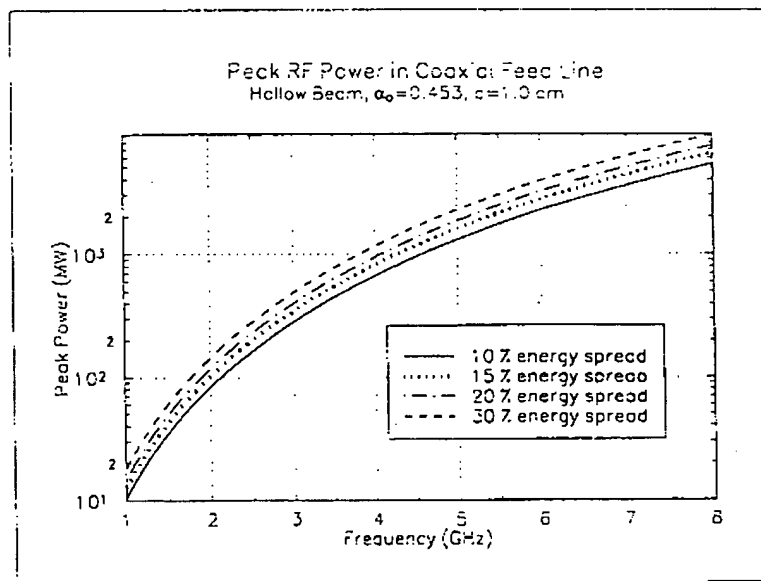
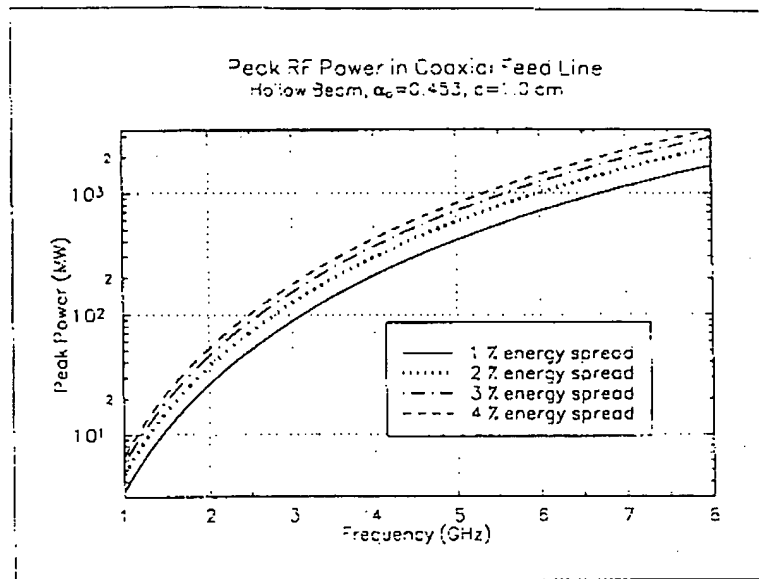


Figure 44: Peak rf power in coaxial feed line for a hollow beam,  $d = 1.0$  cm.

# REPLACEMENT SHEET

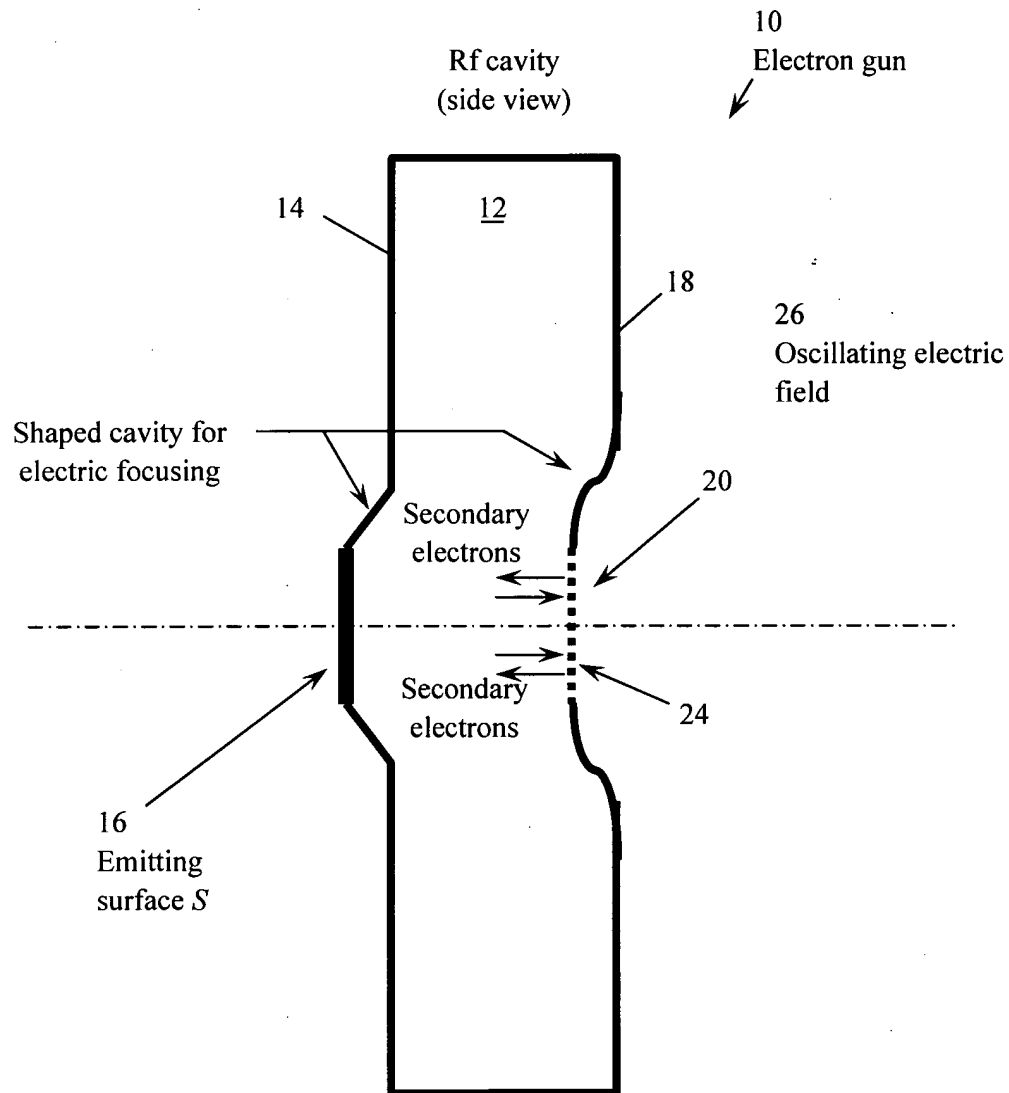


Figure 46: Schematic drawing of a possible design for electrostatic focusing in the MPG.

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**